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Department of English Language and Literature

BACHELOR THESIS

The Role of Schwa in Word Stress Perception

Schwa v percepci slovního přízvuku

Martina Juránková

Supervisor: Mgr. Kristýna Poesová, Ph.D.

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Declaration

I hereby declare that the bachelor thesis The Role of Schwa in Word Stress Perception is completely my own work and that the only sources used in the preparation are listed on the works cited page.

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Martina Juránková

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ANNOTATION

This thesis focuses on a description of the English mid-central vowel schwa as the main protagonist of vowel reduction and its role in the perception of English word stress. The theoretical part provides a description of above mentioned phenomena along with their impact on acquisition of the English language by Czech learners. In the other section of this work a perceptional test which was assigned to several grammar school adn university classes is evaluated.

KEYWORDS

schwa, vowel reduction, word stress, rhythm, prominence

ANOTACE

Tato bakalářská práce se zabývá popisem anglické hlásky "schwa" jakožto hlavním představitelem samohláskové redukce a její rolí v percepci anglického slovního přízvuku. Teoretická část poskytuje popis výše zmíněných fenoménů společně s jejich dopadem na osvojování anglického jazyka českými studenty. V druhé části práce je vyhodnocován percepční test zadaný na několika stupních střední a vysoké školy.

KLÍČOVÁ SLOVA

šva, samohlásková redukce, slovní přízvuk, rytmus, prominence

Introduction

The importance of the English language is rising more than ever before. With English having become the Lingua franca, there is almost no one, nowadays, who would not need or use this language either for personal purposes or in order to fulfil job requirements. Learning a foreign language (L2) may bring many pitfalls, especially when it differs from one's mother tongue (L1) as significantly as in the case of Czech and English.

One of the areas in which we can find much dissimilarity is the sound system of both languages. For example, unlike English, in which primary stress can be tied to any syllable and the vowels in unstressed syllables often undergo the process of vowel reduction, Czech has a fixed stress placement on the first syllable and its standard vocalic system lacks the reduced vowel schwa. It follows that Czech speakers of English may encounter a lot of problems due to the negative transfer in both perception and production of the suprasegmental features. Different prominence patterning in Czech and English create the framework of this thesis, which specifically aims at finding out whether vowel reduction in the form of schwa can help Czech listeners identify stressed syllables in English. In other words, we would like to gain better insight into the matter of English perception of word stress with the contribution of vowel reduction.

The theoretical part delineates the characteristics of schwa from several perspectives including the history of this sound, its classification and the phonetic and phonological point of view. What follows is the classification of syllables ensued by the establishment of the English word stress and the factors that help to identify it. The importance of vowel reduction and the prominence factors, that help not only to identify the word stress but also to preserve the natural rhythm of speech, are highly emphasized.

The practical part tries to outline the findings from the research. A perception test was created, for which the testing items were carefully chosen on the basis of the presence or the absence of schwa, and carried out in several classes with different levels of language. The results are presented in a series of tables and graphs with comments on individual features included. The discussion tries to elaborate on the success rate and possible causes of the error rate. Finally, the conclusion brings a summary of information acquired in the theoretical part with the interpretation of results from the practical part.

THEORETICAL PART

Before we plunge into exploring the unique character of the reduced vowel schwa and how it closely interacts with the suprasegmental phenomena of word stress and rhythm, it is important to clarify the relationship between two sets of terms which describe the same reality (sound) from different points of view (auditory and acoustic).

The auditory perspective describes what one can hear and it is considered to be a more subjective descriptor. Loudness means that sound can be perceived either louder or quieter, length distinguishes sound as longer or shorter, pitch expresses whether sound is higher or lower and colour or quality distinguishes between individual sounds, for example */ɪ/* from */e/*. Each auditory property has its equivalent in the physical property, which is measurable and thus more objective. The acoustic correlates are: loudness corresponds to intensity, length to duration, pitch to fundamental frequency (which is the frequency at which the vocal folds vibrate) and colour is the equivalent of spectrum (Volín qtd. in Cvrček, 40).

1. Schwa

The most frequently occurring sound in English is the neutral vowel schwa /ə/. Its exceptionality may be supported not only by its frequent occurrence in English, but it also corresponds to the biggest number of graphemes and as the only element it was provided with its own name.

Historically, *shva,* in Hebrew, denoted a symbol resembling a colon which was placed below a word to signal the neutrality or the absence of the neighbouring sound. Possibly due to the plentiful occurrence of this word in Germanic languages, did the spelling change to *schwa* (Poesová, 2012, 76).

1.1 Schwa from the phonetic point of view

Schwa is commonly described as a neutral mid-central lax vowel. It is neutral because the lips are not rounded, nor spread when this sound is being produced. Lax refers to low or absent tension between the articulatory organs, which differentiates schwa from its longer and tenser equivalent */ɜ:/* (Poesová, "Speak out!" 31). "In quality it is mid (that is, half-way between close and open) and central (that is, half-way between front and back)" (Roach, "English phonetics" 82). *Vowels* are described as sounds created without any obstruction to the air stream, so the vocal tract is relatively open while producing them.

1.2 Schwa from the phonological point of view

Apart from English, schwa appears in various languages and it emerged from the neutralisation between diverse vowel quality contrasts (Flemming, "Schwa" 1). This vowel occurs solely as a nucleus in unstressed syllables and reduced initial, medium or final positions and at the same time it has a strong tendency to assimilate to surrounding elements, adjacent vowels and consonants, which features it often adopts, so its quality is contextually very variable (Flemming, "Schwa" 1-2).

As a grapheme, schwa corresponds to the majority of vowel letters and combinations of them e.g. *i* in *possible*, *e* in *gentleman*, *a* in *woman*, *o* in *oblige*, *u* in *suppose*, *ar* in *particular*, *er* in *mother*, *or* in *doctor*, *ou* in *famous*, *our* in *colour*, *ure* in *figure*, etc. (Cruttenden, 126). Overall, <a> corresponds to schwa in 30% of words, <o> in 24%, <e> in 13% and <er> in 12%. Furthermore, schwa is a sound with a distinctive function to create minimal pairs with zero phonemes (e.g. about /əˈbaʊt/ x bout /ˈbaʊt/), with front high vowels (e.g. affect /əˈfekt/ x effect /ɪˈfekt/) or with weak i (e.g. sitter /ˈsɪtə/ x city /ˈsɪti/) (Cruttenden, 127).

The timbre of schwa is characterised by its even distribution of formants. Two or three, designated F1, F2, F3, are commonly ample to discern individual vowel qualities from each other. F1 denotes the position of the tongue. The lower the position of the tongue, the higher F1. With F2 the situation is more complex, but it was measured that back vowels have relatively low F2 and front vowels have higher F2. In addition, it was observed that F2 is highly influenced by rounding or spreading lips while producing sounds. Overall, formants depend on the fundamental frequency, which is the rate at which one's vocal folds vibrate. The vibration is contingent on the length, tension and thickness of vocal folds (Gut, 150-153). Kondo tested the acoustic variability of schwa on three British speakers who were asked to read sentences with various VCəCV sequences (*V=vowel, C=consonant, ə=schwa*). The results showed that neither vocalic nor consonantal contexts affected F1 (targeted schwa) as opposed to F2 (targetless schwa) which was substantial and confirms the assimilation of this vowel to its context under the influence of adjacent consonants (74).

It was measured that vocal folds of an average male speaker resonate at 500 Hz, 1500 Hz and 2500 Hz, but this ideal status is hard to achieve due to the previously mentioned contextual variability of schwa (Fant qtd. in Kondo 63).

1.3 Classification of schwa

Several opinions exist on how to classify the schwa sound. All of them share a similar categorization, but in somewhat divergent ways. Silverman's classification encompasses three subgroups. Firstly, he talks about non-alternating schwas (e.g. about /əˈbaʊt/, sofa /ˈsəʊfə/). Secondly, he sees some schwas as epenthetic in syllabic allomorphs indicating the past tense after alveolars (e.g.wanted /ˈwɒntɪd/, loaded /ˈləʊdɪd/) and in syllabic allomorphs indicating the plural or 3rd person singular possessive case after sibilants (e.g. pauses /ˈpɔːzɪz/, chooses /ˈʧuːzɪz/); in these contexts schwa might lean towards */i/*. Thirdly, in stressed positions some schwas may alternate with full vowels (e.g. relax /rɪˈlæks/, relaxation /ˌriːlækˈseɪʃn̩/) (4).

Flemming, on the other hand, finds two types of schwa vowels in the English language. The first type is a true mid-central vowel, which approximates higher vowel qualities (e.g. /i, u/) and it is found mainly in word-final positions e.g. *china /ˈʧaɪnə/, comma /ˈkɒmə/*. The second type is a contextually variable vowel, which usually occurs in word-internal positions as in *suppose /səˈpəʊz/ or probable /ˈprɒbəbl̩/*, where the vowel quality contrasts tend to be neutralised ("Schwa" 2).

Roach claims that according to many phonologists, schwa is an allophone of various vowels. Schwa then is not an English phoneme, but an allophone of vowels occurring in unstressed positions ("English phonetics" 127-128). In initial positions, schwa often alternates with full-vowel qualities (e.g. fantastic /fænˈtæstɪk/ x fantastic /fənˈtæstɪk/, quotation /kwəʊˈteɪʃn̩/ x quotation /kwəˈteɪʃn̩/) and it is up to the individual speakers what option they choose (Poesová, 2012, 2). Besides, in conversational manner of speech schwa is oftentimes left out. It is absorbed by sonants which function as a syllabic centre, which preserves the original number of syllables (e.g. bottle /ˈbɒtl̩/, rock and roll /ˈrɒkənˈrəʊl/) (Poesová, 2012, 3).

In rhotic accents in north America, southwest England and Ireland, schwa is r-coloured when the spelling incorporates the consonant */r/*. This specific colouring is characterised by the so-called "retroflection", which means that the r-sound is pronounced with the tip of the tongue turned back against the roof of the mouth. The Scottish vowel sound system does not contain the schwa sound, so it is replaced by */ʌ/* or */ɪ/*. In non-rhotic accents (England, New Zealand, Australia, New York), r-colouring occurs only as a result of linking when the following word has a vowel in the initial position (Jones, 50).

2. Syllable

A syllable is an organised sequence of speech sounds – vowels and consonants. Vowels create the peak/nucleus of each syllable, they are more sonorous and they can create the so-called minimum syllable (e.g. are /ɑ:/, or /ɔ:/, err /ɜ:/), which is, as the nucleus, obligatory (Gut, 76). Consonants preceding the nucleus are referred to as the onset and according to the maximum onset principle no more than three consonants might occur at the beginning of the syllable. Up to four consonants, even though this number is very rare, might appear at the end of a syllable in order to create the coda. The vowel with the coda create the rhyme. The lack of a consonant at the beginning of a syllable is called zero onset, no consonant at the end of a syllable is called zero coda (Roach, "English phonetics" 70-73). "In some special cases, a consonant can function as the syllable nucleus in a word" (Gut, 76). This occurs when the last syllable of a word does not include a vowel but a nasal or a liquid */n, m, z, ŋ, l, ɹ/*. They are called syllabic consonants and they cannot stand on their own as opposed to the nucleus created by vowels (Gut, 76). A possible reason why the nucleus is not commonly created by consonants is the relative loudness of phonemes, sonority, which, on a sonority scale, happens to be the highest for vowels (Gut, 81).

2.1 Open and closed syllables

Different types of syllables might be found in English. Syllables that do not have any consonants in their coda positions are called open and those with at least one consonant in the coda are called closed (Gut, 77).

2.2 Light and heavy syllables

Syllables that have a long vowel, a diphthong or a short vowel followed by a consonant in a rhyme are called heavy syllables. Light syllables have only a short vowel or a syllabic consonant. In addition, "their distribution is constrained: stressed syllables are always heavy, light syllables are always unstressed and cannot occur on their own" (ibid.).

2.3 Strong and weak syllables

The most common classification suggests that strong syllables are stressed and weak syllables are unstressed. Furthermore, vowels in weak syllables "tend to be shorter, of lower intensity and different quality" (Roach, "English phonetics" 81). Syllabic consonants create peaks of weak syllables as well. Peaks of weak syllables are created by schwa, weak i, which emerges from the neutralization between */ɪ/* as in a "ship" and */i:/* as in a "sheep"

and weak u, which is a result of the neutralization between */ʊ/* in "pull" and */u:/* in a "pool". Syllabic consonants can also create the peak of a weak syllable (ibid.).

3. Vowel reduction

Vowel reduction is a relatively prevalent concept known across the languages concerned with the vowel quality in unstressed syllables. Flemming talks about this phenomenon and explains that due to unstressed syllables the neutralisation of vowel contrasts occurs. "It is typical correlates of lack of stress that condition neutralisation, not stress per se, the relevant correlates being short vowel duration and perhaps reduction in articulatory effort" (Flemming, 3). More specific generalisation about the nature of contrasts that are reduced or erased in unstressed syllables are to be found. Principally, it concerns contrasts of the vowel height which tend to be eliminated before backness or rounding and completely disappear only when all vowel qualities are neutralised to a single vowel, i.e. schwa in English (ibid.).

Fragozo defines vowel reduction as a substitution of a full vowel with schwa /ə/ (695). With regard to duration, schwa is a short vowel, often characterised as "weightless" or "featureless". It was observed that in both British and American dialects of English, most vowels in unstressed positions incline to approach the mid-central vowel, namely, schwa. At the same time, though, unstressed syllables tend to assimilate to surrounding sounds more than stressed ones do. Therefore, the question arises whether vowel reduction is centralisation or contextual assimilation. First to inquire into this matter was Nord (1974) who ascertains that "vowel reduction is a result of increased contextual assimilation" (Kondo, 63) and he also claims that schwa is truly central only when adjoining a pause.

Flemming & Johnson argue that even though *comma /ˈkɒmə/* and *begin /bəˈgɪn/* are described with */ə/,* in some dialects, especially of American English, */ə/* often creates a minimal pair and alternates with */ɪ/.* They use the example of *roses /ˈɹəʊzɪz/* and *Rosa's/ˈɹəʊzəz/.* Both vowels are central, but differ in their height (83). The authors point out that they are not aware of any previous verification of such characterisations. Then a question arises whether the realisation of those reduced vowels is conditioned by some accents of English or an environment as illustrated in the examples of pairs such as *roses* and *Rosa's*. Getting a closer look at the distinction pairs of words and their reduced vowels like the one mentioned, one can see that although both reduced vowels are central, the one

of *roses* is higher than the one of *Rosa′s*. Furthermore, the /ə/ of *Rosa′s* differs from the /ə/ of, for example, *begin*. The difference lies in the position of schwa within the word - the word-final schwa is lower than non-finally placed vowels. That is why the authors suggest using the symbol */ɨ/* for this quality. Besides, the word-final schwa quality is typically preserved after adding some suffixes, in this case the possessive /-z/. Hence, the pronunciation of the unstressed vowel of *Rosa′s* resembles the word-final schwa quality, which differs from the one of *roses* that is similar to the ordinary word non-final quality (Flemming & Johnson, 84).

Sometimes, vowels in unstressed positions are completely left out. This process is called elision and it already appeared in Old English. There are two types of elision – the already established one as in *eaten, written, cousin* and the one resulting from fast, colloquial speech as in *temporary /ˈtemprərɪ/.* This happens usually in the sequence of *consonant + /ə/ + /r/ + weak vowel,* where schwa between a consonant and /r/ is typically omitted (e.g. factory /ˈfæktrɪ/, robbery /ˈrɒbrɪ/). Another sequence, */r/ + weak vowel + consonant*, conditions omission of the weak vowel, thus for example *Dorothy /ˈdɒrθɪ/.* Elision of a weak vowel is also frequent before */l/* in words such as *family /ˈfæmlɪ/* and in some other words including *national /ˈnæʃənl̩/, university/ˌjuːnɪˈvɜːstɪ/,* etc. The same applies to weak syllables in positions preceding primary stress. Overall, in a formal speech, speakers ordinarily tend to maintain fuller forms of vowels instead of omitting them (Cruttenden, 235-236).

Fragozo notes that native speakers pronounce reduced vowels in function words in order to maintain the natural flow of speech. On the contrary, non-native speakers very often tend to pronounce full-vowel qualities in function words even when there is no need of emphasis, which disrupts the rhythm, therefore the unnatural flow of speech and a non-native accent may be recognised (695).

As mentioned at the beginning of this section, two different perspectives exist on the concept of vowel reduction. The traditional approach sees it as a centralisation – a process during which the majority of vowels head towards the mid-central vowel schwa. From the other perspective, it was found out that schwa strongly coarticulates with surrounding sounds, which contributes to the understanding of vowel reduction as a contextual assimilation which conditions the movement of the individual realisations of schwa from the central position towards the surrounding sounds (Kondo, 63).

Vowel reduction is conditioned by physical abilities of modulating organs, the tongue in particular, and the whole process of communication. Simply stated, the impulse for vowel reduction emerges from a shortening of the unstressed syllable, because it is not possible for the articulatory organs to perform the same movements in syllables with different lengths (Veatch qtd. in Poesová, 2012, 81). The acceleration of articulation requires an effort, but in order to save energy, the articulatory organs avoids the demanding task of pronouncing a full vowel-quality and resorts to pronouncing a low vowel from the position of the adjoining consonant (Flemming, "Vowel reduction" 6).

4. Prosodic features of English

Prosodic features, or sometimes labeled as suprasegmental features, are those that split up the utterance and link it into higher syntactic phrases. They count word stress, sentence stress, rhythm, intonation, Bělíček adds timbre and quantity. For this thesis, not all them are relevant, so the next step will inquire into quantity and mainly stress and rhythm (168).

4.1 Quantity

Quantity, sometimes referred to as a syllabic length, means the duration of a syllable. Bělíček talks about *mora* - the basic unit of quantity which corresponds to the duration of a short vowel. "In such a quantitative language as Czech is, the long vowels are two-mora sounds, they last twice as long, because their quantity equals two short vowels. English is different, its quantity is a positional phenomenon of low relevance. In English and most Indo-European languages quantity acts as an accessory and facultative device of accentuation" (Bělíček, 169). Quantity, in English, divides vowels into short vowels, long vowels and half-long vowels which are the result of pre-fortis shortening/clipping. This term refers to a shortening of vowels that occur before voiceless consonants. Stressed syllables then contain seemingly long vowels only in case of the absence of the coda in a syllable or when the peak is followed by a voiced consonant. Hence, the vowel duration is described as relative since it is not measured in milliseconds and it differs according to a voiced or a voiceless consonant the vowel stands before and due to this phenomenon the longer counterpart of a short vowel (e.g. /i: - ɪ/) may become shorter than the short one occurring in front of a lenis consonant (Cruttenden, 97). Volín mentions an example of *set* and *said*, explaining that */e/* in *said* is longer than in *set* with other characteristics remaining equal. Pre-fortis shortening is stopped by morphematic boundaries, i.e. */ei/* in

day one and *day two* will be of the same length. Apart from all of this, although this concept appears in the Czech language, it is quite insignificant, so it naturally causes problems to Czech learners of English, especially in positions where pre-fortis shortening is strong, particularly in monosyllabic words with a fortis consonant in the final position (Volín, "IPA" 70).

4.2 Word stress

Researchers commonly distinguish between word (lexical) stress and sentence stress. Word stress means the accent put on certain syllables within words. In connected speech, sentence stress refers to the rhythm of a language meaning the accentuation of some parts of the utterance similar to the accentuation of individual syllables in the word stress (Cruttenden, 249). Through sentence stress, individual words vital for understanding may be emphasized (Mompeán,2). They are called lexical words and they cover commonly main verbs, adverbs, nouns, adjectives and demonstrative pronouns. Auxiliary verbs, conjunctions, prepositions, pronouns, relative pronouns and articles create function words, which are typically unstressed unless the meaning requires it (Cruttenden, 249).

Word stress then refers to a syllable that is more prominent than the neighbouring syllables, so that a listener can identify the individual word and decode its meaning. Therefore, word stress might be investigated from two perspectives – production, which signifies greater muscular energy for stressed syllables, and perception, which means that the stressed syllables are more prominent (Roach, "English phonetics" 93-94).

"In phonetic terms, stressed syllables in English are produced with a stronger burst in initiatory energy – a more powerful contraction of the chest muscles – than unstressed syllables are. On the acoustic side, this increased energy input results in greater loudness, increased duration and often – mainly in case of primary stress – a change of pitch" (Giegerich, 179).

In disyllabic words it is ample to distinguish between stressed and unstressed syllables, while in polysyllabic words Heffner suggests to distinguish between the primary (full), secondary (half) and minimal stress (226). It is prevalent, though, to determine only primary and secondary stress as the other levels of stress are normally problematic to discern (Gut, 90). Cruttenden and Roach, although they differ in terminology, divide stress into 4 groups: primary stress, secondary stress, unstress with a full vowel and unstress with a reduced vowel or a syllabic consonant (Cruttenden, 223; Roach, "English phonetics" 95).

4.2.1 Secondary stress

Secondary stress appears on one of the syllables preceding the primary stress and it preserves a full vowel quality, yet shorter than the primary stress and it appears in words consisting of three or more syllables (Gut, 88). If there is only one syllable preceding the primary stress, it usually remains unaccented. With two syllables before the primary stress, the first one will be often stressed (Cruttenden, 228). Secondary stress is also marked by a pitch change but lower than in the primary stress. Any vowel but /ə/ is capable of creating the peak of a syllable carrying the secondary stress. Peaks of the remaining syllables (those carrying neither the primary, nor the secondary stress) may consist of full vowels as well (except for reduced vowels /ɪ, ə, ʊ/ which create peaks of unstressed syllables), which are, however, only weakly accented (Cruttenden, 146-147).

4.2.2 Placement of the word stress

Different kinds of a placement of word stress occur across languages: fixed stress, which always falls on a specific syllable in all or in most of the words of the particular language (e.g. Czech, Polish, French), and free stress, which does not have a consistent stress pattern functioning in the same way for the majority of words of a language. In terms of the English language, word stress is not only free, but it is also used lexically in order to distinguish word-classes. It should be noted that English stress might be seen as fixed as well since it does not move within individual words unless there is a stress-shift (Gut, 89). Several factors function as indicators of the stress placement: *morphology*, which divides words on simple (e.g. dog), complex (e.g. marvellous) and compound (e.g. blackbird); *word class*, which brings the division to nouns and verbs (ˈcontact x conˈtact); *phonological distinction* on strong and weak syllables; *context* and *the origin of words* (Roach, "English phonetics" 97).

4.2.2.1 Stress-shift

The concept of stress-shift (sometimes referred to as *variable* stress) appears in English, which deals with the variation in the accentual patterns of words. If the primary stress is preceded by the secondary stress and if, in connected speech, another strong accent follows closely, the first primary accent must be dropped, because English avoids adjacent stressed syllables. Thus one says /ˌθɜːˈtiːn/ but /ˈθɜːtiːn ˈpaʊndz/ or /ˌɑːftəˈnuːn/ but /ˌɑːftənuːn ˈtiː/ The secondary stress may be lost when another word with secondary stress immediately precedes, e.g. /ˌfraɪdeɪ ɑːftəˈnuːn/ (Cruttenden, 280).

4.2.3 Prominence factors

In English, which belongs to the Germanic languages, linguistic prominence demonstrates a raise in *duration* i.e.stressed syllables are perceived as longer, in *fundamental frequency* i.e.stressed syllables are perceived as higher, in *articulatory accuracy* i.e. the peak of stressed syllables contain a full vowel quality and in *intensity* i.e. stressed syllables are perceived as louder (Mooshammer, 1). These four factors are vital in determining different levels of stress, although John Laver argues that only three parametres (pitch, loudness and duration) facilitate perceiving stress (512).

In order to achieve the primary stress, the four (or possibly just three) above mentioned factors must be fulfilled. Laver mentions Fry's research on acoustic and perceptual correlates of lexical stress in English and he rates the prominence factors according to their importance (513). Fry's reasearch, however, dealt exclusively with isolated words. Nevertheless, here is what he, and others, discovered.

Perceptually the most significant aspect happens to be pitch (especially higher). Cruttenden adds that pitch prominence depends not only on pitch height but also on pitch change. Therefore the accentual patterns for individual words differ, which for instance enables listeners to distinguish between the word classes (e.g. *insult /ˈɪnsʌlt/* is a noun x *insult /ɪnˈsʌlt/* is a verb). The second most essential element came out to be (longer) duration and Cruttenden adds that long vowels and diphthongs usually carry stronger prominence than short vowels. The third being (greater) intensity. "Greater loudness is carried principally by voiced sounds, in which greater amplitude of vibration of the vocal folds, together with the reinforcing resonance of the supraglottal cavities, results in, acoustic terms, in relatively greater intensity. This strong intensity and the perceived loudness on the part of the listener results from the relatively greater breath effort and muscular energy expended on the articulation of a sound by the speaker" (Cruttenden, 223). The last indicator was quality dividing vowels on full and reduced (Fry).

4.3 Rhythm

As mentioned earlier, three (sometimes divided into four) suprasegmental features function in the English language. J.C.Wells describes them as the prosodic characteristics of speech – pitch, loudness and speed which combine together to create the rhythm of speech (3). The term rhythm, although explored many times, does not provide a universally accepted definition (Volín, *Patterns* 279). To support this claim, Volín mentions E. Isaacs, who

performed some comparisons of definitions available at that time (1920) and he also did not find consistency between them. Bělíček describes rhythm as "...a tendency to a regular cadence of stresses" (Bělíček, 169) .

Stressed syllables in the English language tend to occur in regular intervals regardless of the number of unstressed syllables between them. English rhythm is then called "stress-timed". The contrast between stressed and unstressed syllables is vital for the native speakers to identify the meaning of an utterance. As mentioned in the chapter about syllables, strong syllables are recognised for being louder, higher and with a full vowel quality. Weak syllables, usually in the form of schwa, thereafter help strong syllables to become even more apparent.

On the contrary, Czech places the primary stress on the first syllable of words and belongs to languages with the syllable-timed rhythm with the stressed and unstressed syllables of approximately the same length (Roach, "Stress-timed" 1-2).

5. Language acquisition

What is the maximum age a learner of a language can reach in order to be capable of achieving the same results as native speakers? Generally, there is an assumption that one can acquire the native-like level up until puberty. Later than that, learning is not possible through biologically determined mechanisms and therefore some other (non-specific) mechanisms must be employed. It appears that some aspects such as vocabulary are not dependant on the age of acquisition, the amount of exposure or motivation, whereas others such as syntax stay problematic. On the other hand, it is usually believed that adult learners are capable of acquiring even the most difficult foreign language dissmilarity with the right input provided (Gallés, 240 – 241). The noteworthy fact is that in the acquisition of L1, even the most complicated vowel system is completed before the consonant system. Children typically acquire all vowel sounds around the second year of their life, with the babbling starting usually earlier where mostly [a] type vowels occur.

Comparing English and Czech, English provides speakers with twenty vowel sounds (twelve monophthongs and eight diphthongs), whereas Czech only includes ten monophthongs and three diphthongs. Learners of a foreign language tend to filter, in this case vowels, through the system they already know from their mother tongue. Gallés names this process *mutation* (Gallés qtd. in Poesová, "Testing perception" 1-2) and it

follows up the idea of a speech illusion which explains that Czech learners perceive the schwa sound through one of the Czech short vowels. The wrong identification of this mid-central vowel does not impede the understanding of the meaning of the individual words, but it can affect the understanding of the natural flow of continuous speech as schwa creates peaks of syllables in function words. Furthermore, replacing schwa with a full-vowel quality in production leads to odd rhythm and it might confuse native speakers (Volín, "Anglická střední středová samohláska" qtd. in Poesová, "Testing perception" 2).

On the whole, English pronunciation is unstable compared to Czech. Very often one word has more than one possible pronunciation which can be interchangeable in terms of the usage of either /ɪ/ or /ə/ in unstressed syllables, in terms of the compression of two syllables into one as in */kənˈviːniənt/* which then changes into */kənˈviːnjənt/* and also in terms of different levels of assimilation e.g. *tuna* can be pronounced as */ˈtjuːnə/* or */ˈʧuːnə/* or even */ˈtuːnə/*. On the basis of the instability of the English pronunciation, Volín claims that Czech students are often reluctant to believe their teachers after they claim pronunciation may highly vary even within a single word e.g. garage might be pronounced as */ˈgæraːʒ/* or */gəˈraːʒ/* or */ˈgærɪʤ/* (Volín, "IPA" 11).

A phonological system is especially difficult regarding both the production and the perception point of view. As a matter of fact, learners of L2 are strongly influenced by their L1, mainly in perception. The English vocalic system is richer than the one of the Czech language, therefore learners of English have to broaden their knowledge of different kinds of vowels. As this thesis deals primarily with the vowel schwa, the following occupation with English vowels will be aimed at this sound and the relating issues (Poesová, "Testing perception" 1).

Although, there is no equivalent of the schwa sound in the Czech language, this sound is not completely unknown to Czech speakers as it appears while producing some letters in isolation, e.g. /bə, də, sə/ (Skaličková, 94). In non-standard Czech, this vowel appears due to a faster speech or carelessness (Volín qtd. in Cvrček, 44). Volín also mentions the existence of */ɜː/* as a hesitation sounds, which might be acknowledged by Czech speakers. In addition, he claims that Czech speakers might doubt the existence of schwa, as it does not have a phonemic status in their mother tongue, and thus they rather ignore it (Volín, "IPA" 39). Confusion may also come from the English spelling as well as the usage of the Roman alphabet where there is, however, no grapheme-to-phoneme correspondence.

It is necessary to mention that the production itself is not difficult for Czech learners of English. It is the distribution, which is caused by the fact that schwa corresponds to various graphemes, that is difficult for learners. This tendency is supported by the fact that the Czech language realises full vowels in both stressed and unstressed positions, with little awareness of this phenomenon and its graphical counterparts (Poesová, 2012, 4).

When learning and acquiring a foreign language, three kinds of the mother tongue influence arise – positive, negative and zero. The positive influence is based on some similarities between the two languages. Then, the student's knowledge of his/her mother tongue helps him/her in the acquisition of L2. Some opinions used to see L1 as an obstacle in learning L2, but nowadays positive transfer is seen as something very useful and helpful which motivates students and encourages them to progress faster. The negative impact of the mother tongue manifests itself by means of the negative transfer, or, in other words, interference. It concerns the outer form of a language (the production of sounds, accent, intonation,…) as well as the inner form (linking of words, transfer of idioms into a foreign language,…). Mistakes and errors are consequently made under the influence of this negative transfer and it can also be explained from the psychological point of view. Students who learn a new language process new information on the basis of their L1 experience. It is something they are used to, it seems natural and generally valid which make them bring it into their L2 (Krystýnková, 48).

5.1 Current research

To briefly demonstrate that this topic repeatedly appears in current research a few works were chosen such as *English Word Stress in the Perception of Czech Listeners* by Radek Skarnitzl or, for example, *Testing the Perception of Schwa, Vliv systematického používání vybraných metod výuky výslovnosti anglického jazyka na percepci a produkci hlásky schwa u žáků ZŠ* and *The production of the Mid-Central English Vowel Schwa in Repeated and Read Words* by Kristýna Poesová. The results are usually very similar to what will be presented in the following chapters of this thesis and show that Czech students tend to follow other prominence factors rather than vowel reduction.

Skarnitzl writes in his research about the perception of English word stress by Czech listeners that "…we c/annot answer the question which acoustic cue is exploited most by Czech listeners when identifying the stressed syllable in English words. However, we can infer something about the predictability of their difficulties based on the acoustic structure of words. The results suggest that there is a significant correlation between the students'

difficulties in recognizing the stressed syllable, expert assessment of the stressed syllable's prosodic prominence, and the objective salience of the stressed syllable. The more conflicting acoustic cues there are concerning the stressed syllable, the greater difficulties students have with its identification" (*Patterns*, 193).

PRACTICAL PART

Aim and hypothesis

The practical part of this bachelor thesis concentrates on research investigating the ability of Czech grammar school and university students to distinguish the primary stress in English polysyllabic words. Its objective is to reveal whether the identification of stressed parts is facilitated by the presence of the mid-central vowel schwa in their vicinity. Taking into consideration the nature of word stress and the prominence patterns in which vowel reduction plays an important role, the following hypothesis was formulated:

The presence of schwa in the immediate surrounding of a stressed syllable contributes to its better and easier identification by Czech learners of English. In other words, stressed syllables become more easily perceptible if schwa occurs in their vicinity, either before the stressed syllable, following it or in both positions.

6. Method

In order to find out whether the hypothesis stated above can be confirmed or not, the following research design consisting of three main phases was created. Firstly, suitable words were collected and divided into three distinct groups: those with schwa preceding the primary stress (e.g. taboo /təˈbu:/), words in which schwa flanks the syllable carrying the primary stress (e.g. resurrection /rezəˈrekʃn̩/), words without schwa (e.g. shampoo /ʃæmˈpu:/). Later, eleven words which canonically contain schwa were chosen to be recorded with full vowel qualities instead (e.g. savannah /sʌˈvænʌ/). Secondly, a native speaker was chosen to record the selected items. Thirdly, a perception test was devised and carried out in six different classes at a grammar school and in three seminars of English phonetics and phonology at a university level.

6.1 Test preparation

6.1.1 Word choice criteria

Approximately seventy words were chosen from the Oxford Advanced Learner's Dictionary (Turnbull). Forty-seven words were later used for the research. Three criteria were considered before the investigative items were selected. The first criterion concerned the presence and the absence of the schwa sound. Schwa present in words either preceded

the primary stress (see table 1) or both preceded and followed the stress (see table 2). For the words without schwa see table 3. One extra category was added. It consisted of eleven words, nine of which were previously used in the groups with words including schwa, but their pronunciation was modified in a way that all schwa sounds were replaced by full-vowel qualities (see table 4). The second criterion regarded a roughly balanced number of two, three and four syllable words and the third criterion applied to the difficulty of chosen items. There was an effort to choose higher-level words. The author made sure that most of them are not commonly taught to students or at least assumed that most of them would not be in their active vocabulary, thus they will not know the pronunciation by heart and will rely on the stimulus.

Attention was also paid to a non-repetitive placement of stress in individual items regarding the order of words on the answersheet. On the handout the words were mixed in four sets of twelve, twelve, twelve and eleven words. All in all, there are eight words that have two syllables, twelve have three syllables, eleven have four syllables and six have five syllables. Twelve words contained the mid-central vowel preceding the primary stress; in the other set of eleven words this vowel was found both before and after the main stress and the remaining thirteen items did not include schwa at all. The last group included eleven words which were recorded with full vowel qualities instead of schwa.

One word, *resurrection*, was used twice to ascertain that the students do not determine the stress randomly. Five extra words were used as examples on which the procedure of the perception test was demonstrated. These words were assumed to be recognised by students which should motivate and encourage them before the real test.

taboo	/təˈbuː/
submit	/səbˈmɪt/
acknowledge	/əkˈnɒlɪʤ/
jamboree	/ˌʤæmbəˈriː/
Japanese	/ˌʤæpəˈniːz/
stewardess	/ˌstjuːəˈdes/
facilitate	/fəˈsɪlɪˌteɪt/
retrospective	/ˌretrəʊˈspektiv/
solicitor	/səˈlɪsɪtə/
voluminous	/vəˈljuːmɪnəs/
cosmopolitan	/ˌkɒzməˈpɒlɪtən/
sophisticated	/səˈfɪstɪkeɪtɪd/

Table 1. A list of words in which schwa precedes the primary stress.

Collision	/kəˈlɪʒn̩/
Savannah	/səˈvænə/
Aberration	/ˌæbəˈreɪʃn̩/
Fraternity	/frəˈtɜːnətɪ/
Metonymy	/məˈtɔːnəmɪ/
Resurrection	/ˌrezəˈrekʃn̩/
Vernacular	/vəˈnækjələ/
Crystalography	/krɪstəˈlɒgrəfɪ/
Haematology	/ˌhiːməˈtɒlədʒɪ/
Paternalism	/pəˈtɜːnəlɪz m̩/

Table 2. A list of words in which schwa precedes and follows the primary stress.

campaign	/kæmˈpeɪn/
forehand	/ˈfɔːhænd/
graphite	/ˈgræfaɪt/
hubcap	/ˈhʌbkæp/
opaque	/ɒʊˈpeɪk/
shampoo	/ʃæmˈpuː/
chimpanzee	/tʃɪmpænˈziː/
petrified	/ˈpetrɪfaɪd/
phlegmatic	/flegˈmætɪk/
silhouette	/ˌsɪlʊˈet/
statuette	/stætʃʊˈet/
tabulate	/ˈtæbjʊleɪt/
notwithstanding	/ˌnɒtwɪðˈstændɪŋ/
participate	/pɑːˈtɪsɪpeɪt/

Table 3. A list of words with the absence of schwa.

Japanese	[ˌʤæpeˈniːz]
savannah	[sʌˈvænʌ]
acropolis	[ʌˈkrɒpɒlɪs]
fraternity	[frʌˈtenɪtɪ]
paternalism	[pʌˈtenʌlɪzm]
solicitor	[sɒˈlɪsɪtɚ]
vernacular	[veˈnækjʊlɚ]
cosmopolitan	[ˌkɒzmɒˈpɒlɪtʌn]
crystalography	[krɪstʌˈlɒgrʌfɪ]
sophisticated	[sɒˈfɪstɪkeɪtɪd]

Table 4. A list of words with the altered full-vowel quality pronunciation.

6.2 Speakers

The first attempt to record the material was realized by an American native speaker who did not fulfil all the demands required by the author including an adequate pace, standard pronunciation and intonation. Furthermore, he was not able to properly pronounce full

vowel qualities instead of schwa in words from the last set. The second attempt was successfully made by a British speaker, John Whalley, who was born in Nuneaton, Warwickshire, the United Kingdom. John graduated from Humanities at Lincoln University and currently teaches English studies at Jan Palach Grammar School.

Regrettably, he was not able to produce the modified pronunciation of words, so it had to be recorded by the author of the thesis. In the test, this part was separated from the rest, so it did not cause much disruption or confusion for the respondents.

6.3 Recording

The speaker recorded all words in the carrier sentence "Now I will say _____ once more again", so that the prosodic characteristics were preserved. In other words, any unwanted linking as well as very clear dictionary pronunciation was avoided which otherwise might have made the primary stress overly obvious and the results might have been affected. The speaker was instructed and controlled to produce the phrases at the same pace and volume. In ten words the speaker was demanded to substitute the schwa sounds with the corresponding full vowels and at the same time preserve the original stress pattern. The aim of this modification was to have two identical words which differed only in the presence or the absence of the neutral vowel schwa. However, the task turned out to be too difficult for the speaker.

Every sentence was recorded at least twice using the Roland Edirol R-09HR portable digital recorder in a silent classroom. Subsequently, the sample sentences were processed in the Samplitude Music Studio 15 and the number of forty-seven testing and five trial items were cut off and put together in a random order to create the final version of the test. The quality of the original sound was maintained, only the volume was normalised. In the trial section, each word was repeated and separated from the others by the speaker saying "example 1 to 5". The pattern looks as follows: *example 1 – 1 sec – word – 2 sec – word – 1 sec – example 2.* In the testing part each word was repeated and individual items were separated by a doorbell which fulfilled the function of desensitization. The pattern looks as follows: *doorbell – 1 sec – word – 1.5 sec – word – 2 sec – doorbell.*

6.4 Piloting

The first draft was tested on a group of six adult intermediate speakers of English who performed reasonably well. Their prompts were taken into consideration and minor alterations to the answersheet and recording were made. For instance, the arrangement of

the text on the handout was changed and the pause after the five-syllable words in the recording was extended.

6.5 Listeners

A total number of 185 respondents took part in the perception test, 67 men, 118 women, all of the Czech origin. From this group, thirty people were first-year university students at the Department of the English Language and Literature at the Faculty of Education in Prague, aged 19 to 26, who were partially trained in English phonetics and phonology. The rest were students of a grammar school from the age of 16 to 19. In this group, twenty four students attended the second year of the four-year course, twenty-eight students were in the third year and thirty in the fourth year of the same course. From the eight-year course, twenty-four students attended the second year, twenty-five attended the third year and twenty-three attended the fourth year. As far as the author knows, none of the students were trained in the examined phenomenon.

At the beginning of each assigning, students were asked to fill in a short questionnaire including their age, their gender, their level of English, the length of their studies of English, a possible contact with a native speaker. Most of them stated to be in contact with a native speaker on average once a week. Many respondents mentioned frequent contacts with native speakers via social networks. In addition, all the grammar school students study German as a second foreign language.

6.6 Test distribution

The procedure of the test distribution followed the same steps in all nine classes. Firstly, the respondents were acquainted with the author of the thesis and her work. Secondly, they were given the answersheets and they were asked to fill in the heading. Afterwards they were provided with the information about their task and the author made sure that they understood the terms *prominence* and *stressed syllable*. The author assured that everyone understood by asking which syllables in words such as *banana, Calgary, Japan* were stressed. She demonstrated on the whiteboard how they should mark the stressed syllable – to put a cross on the dash that bears the most prominent syllable. One line corresponded to one word and one dash corresponded to one syllable. The students were instructed to mark only one syllable in each word. Before listening to the recording 4, they were reminded of the change of the speaker. Test distribution went very well and no problems arose.

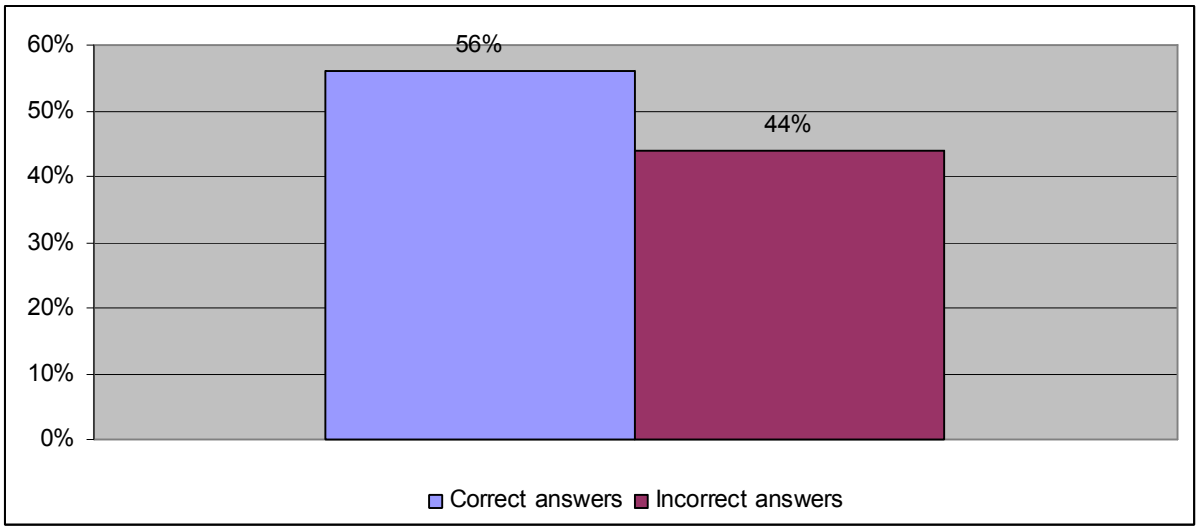
6.7 Data analysis

The amassed data from the questionnaires were submitted into a relational database created in the FoxPro programme and three charts were generated, named "Students", "Phrases" and "Answers". Each student and each answer were provided with a unique number, which in total comprised over 8000 entries that had to be evaluated. The data were put into the Excel spreadsheet and subsequently converted into component diagrams and percentage graphs.

7. Results

7.1 Non-modified words

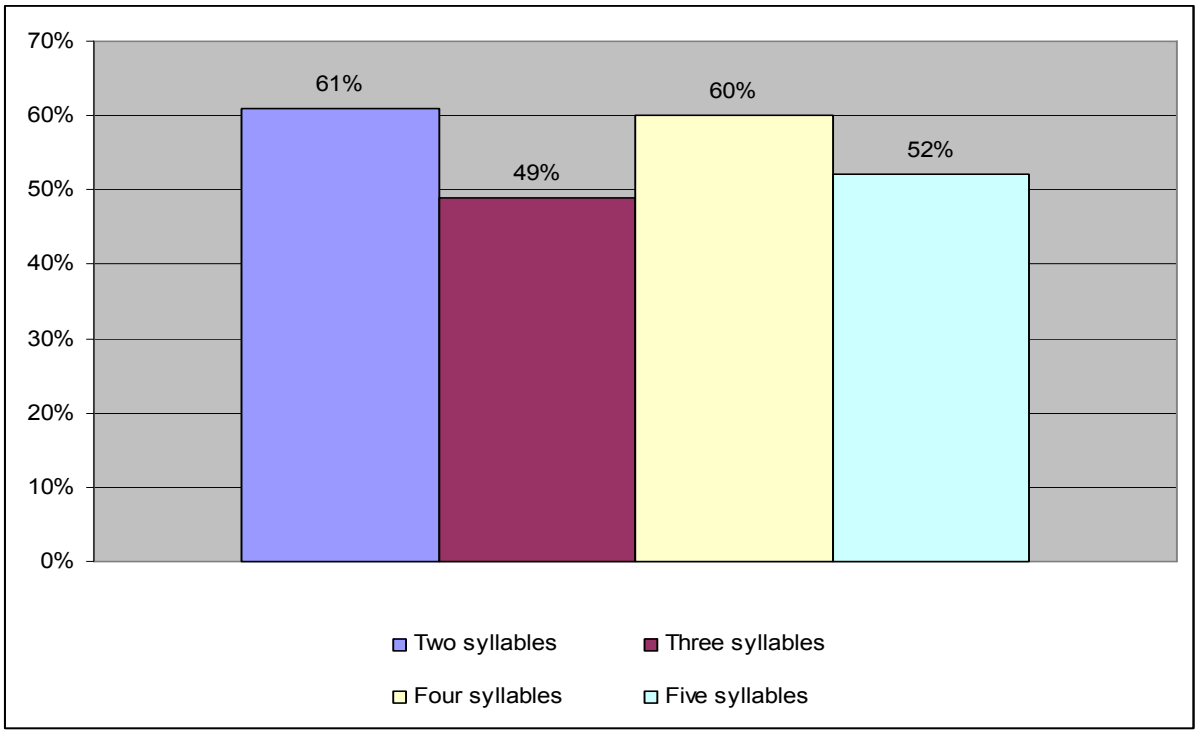
The data were evaluated from several points of view, from more general to very specific ones. When necessary, the results were rounded to whole-numbers. In this section, the overall results of non-modified words will be presented. The subdivision on more specific groups and their results will be discussed in some detail in the next chapters. Overall, 44% of the answers were identified incorrectly, by both male and female listeners, which means that more than a half of the respondents, 56%, determined the stress correctly (see graph 1).



Graph 1. The percentage of correctly and incorrectly identified stressed syllables in non-modified words by all respondents.

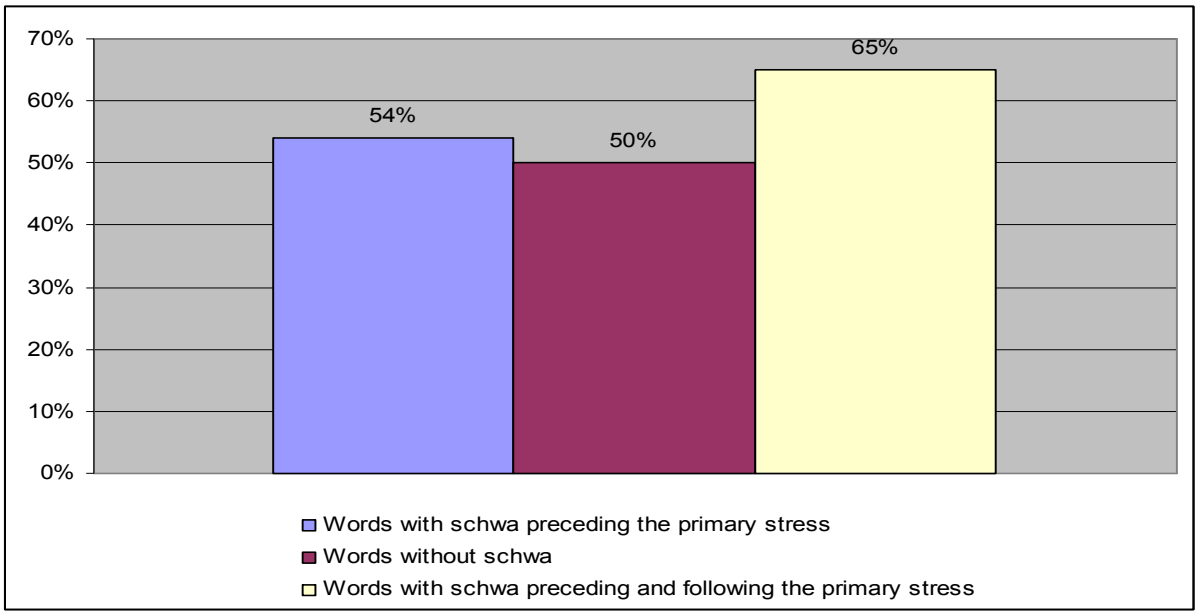
From the perspective of how many syllables a word is formed of, it was found out that on average, stress in two-syllable words was correctly perceived by 61% of listeners, in three-syllable words by 49%, in four-syllable words 60% of the students marked the stress

correctly and five-syllable words were correctly determined by 52% of the respondents (see graph 2).



Graph 2. The success rate according to the number of syllables the words consist of.

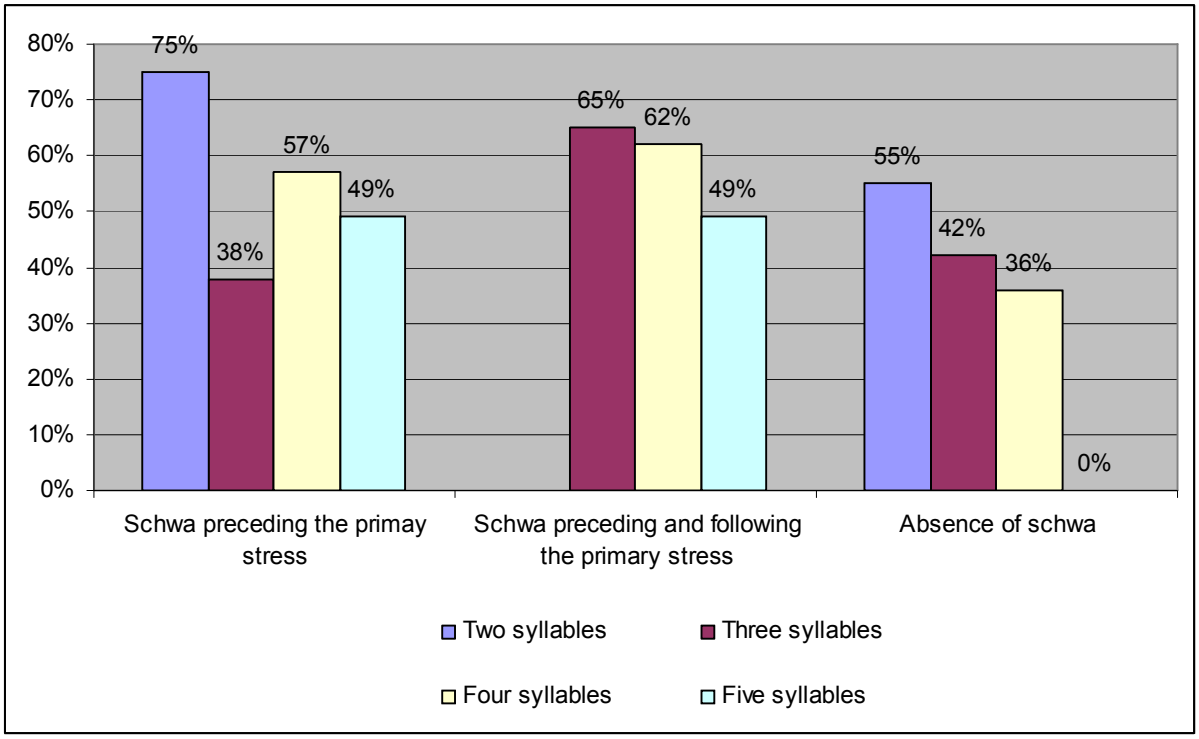
Considering the presence of schwa in front of the main stress, 54% of all students answered correctly, while in words with schwa preceding and following the main stress, the success rate increased to 65%. In words containing no schwa at all, the success rate equalled 50% (see graph 3).



Graph 3. The success rate in words according to the absence or presence of schwa either preceding the primary stress or both preceding and following the primary stress.

7.1.1 Grammar school students: four-year course

Another classification was made according to the educational facility the participants attended. The first analysis focused on 84 students from the four-year grammar school course. When examined to determine the primary stress in two-syllable words with schwa preceding the primary stress, 75% participants answered correctly, with three-syllable words it was, however, only 38%, with four-syllable words 57% and five-syllable words were correctly identified by 49% of the respondents. For schwa both preceding and following the main stress, there were no two-syllable words. In three-syllable words 65% of students were correct, in four-syllable words 62% of the respondents answered correctly and in five-syllable words, 49% matched the correct answer. Stresses in two-syllable words without schwa were correctly marked by 55% of the students, 42% marked the correct stress in three-syllable words, 36% in four-syllable words. No five-syllable words without schwa appeared in the test (see graph 4).



Graph 4. The success rate in words with the presence or the absence of schwa with regard to the number of syllables marked by the students of the four-year course at the grammar school.

Students of this course were most successful at identifying the primary stress in two-syllable words with schwa before the primary stress with the rate of success being 75%. Regarding the schwa both preceding and following the primary stress, they were most successful in three-syllable words (65%) with the difference of only 3% in four-syllable words (62%). Words with full-vowel qualities turned to be less successful overall. The arithmetic mean of all words with schwa preceding the primary stress showed that 55% of the students of this course determined the stress correctly. Regarding schwa that flanks the primary stress, the arithmetic mean was 59% and for words without schwa 44%.

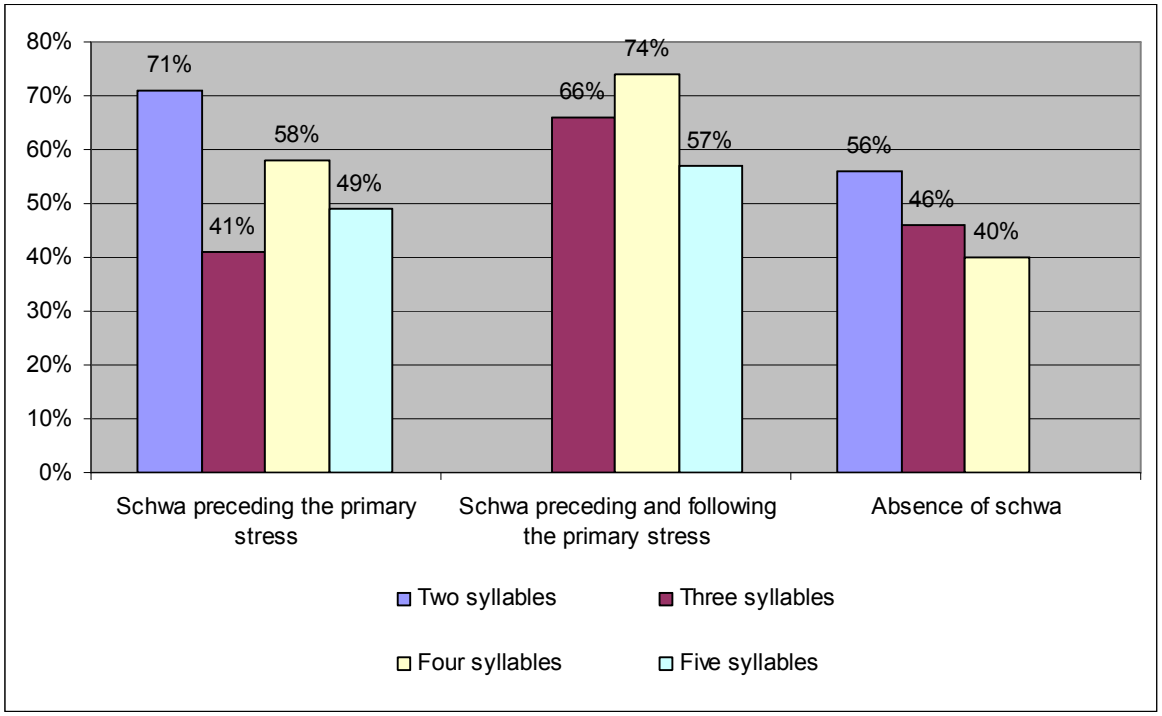
7.1.2 Grammar school students: eight-year course

Slightly higher scores were found out from the students of the eight-year grammar school course. Here, 71% placed the stress correctly in two-syllable words where schwa preceded the main stress. Three-syllable words were marked correctly by 41% of the listeners, four-syllable words by 58% and five-syllable words by 49%.

Regarding schwa preceding and following the main stress, no two-syllable words occurred, in three-syllable words 66% of the solvers were successful, four-syllable words were

successfully marked by 74% of the test-takers and five-syllable words were successfully marked by 57% of the students.

The stress was correctly marked by 56% of the students in two-syllable words with the absence of schwa, in three-syllable words 46% of the participants found the correct stress and in four-syllable words 40% of all answers were correct. Again, no five-syllable words appeared (see graph 5).



Graph 5. The success rate in words with the presence or the absence of schwa with regard to the number of syllables marked by the students of the eight-year course at the grammar school.

Students of this course were also most successful at identifying the primary stress in two-syllable words with schwa preceding the primary stress (71%). Regarding the items with schwa both before and after the primary stress, the respondents were most successful in four-syllable words (74%). The absence of schwa in words showed, as in the previous group, slightly lower results. When arithmetic means were calculated, the results showed that for schwa preceding the primary stress, the result was 55%, for schwa surrounding the primary stress it was 66% and for words without schwa at all, it was 47%.

7.1.3 University students

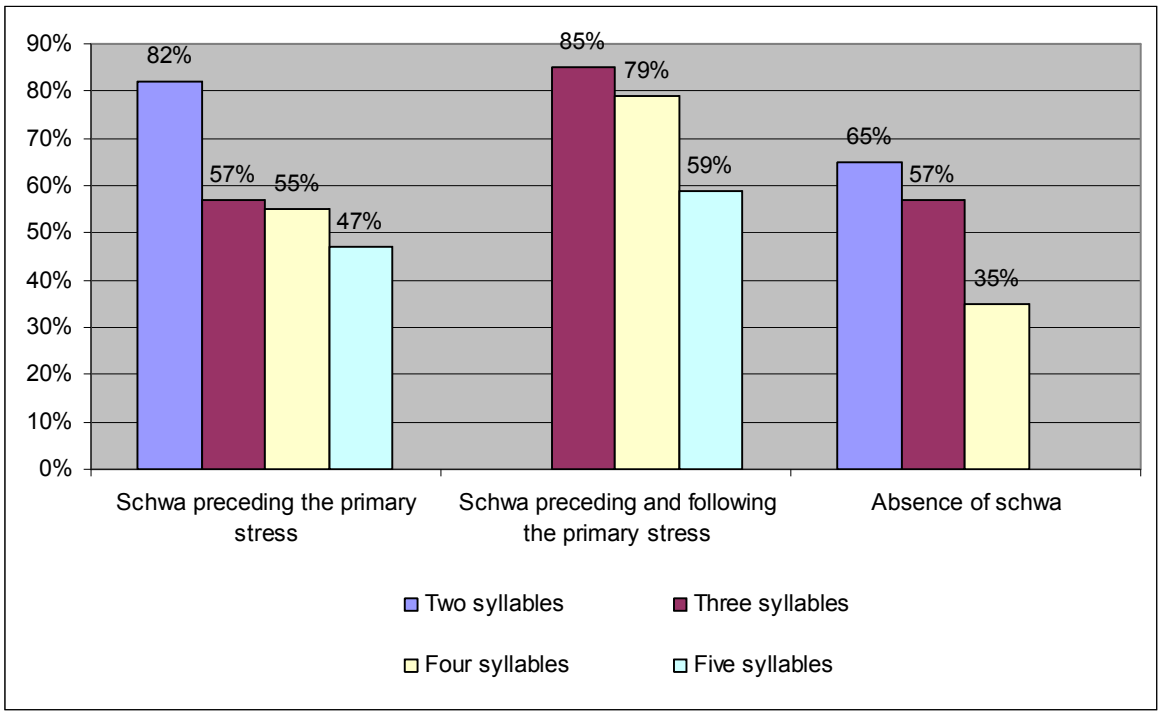
Even higher rates were achieved by university students. Two-syllable words with schwa before the main stress were marked correctly by 82% of the respondents, in three-syllable

words they were less successful reaching 57%. Four-syllable words were correctly marked by 55% of the respondents and five-syllable words by 47% of the listeners.

Two-syllable words with schwa placed both before and after the main stress did not occur again, but three-syllable words were correctly labeled by 85% of the students, 79% of them marked correctly the main stress in four-syllable words and 59% in five-syllable words.

In words with the absence of schwa, two-syllable words were marked correctly in 65%, three-syllable words in 57%, four-syllable words in 35% and, again, no five-syllable words occurred (see graph 6).

University students were also most successful at marking the primary stress in two-syllable words with schwa preceding the stress (82%). In words with schwa both preceding and following the primary stress, three-syllable words were the most correctly marked ones (85%). The arithmetic means showed that words with schwa preceding the primary stressed were correctly determined in 60% of the cases, words with schwa surrounding the primary stress were correcly determined by 74% of the respondents and words with the absence of schwa were correctly perceived by 52% of the participants.



Graph 6. The success rate in words with the presence or the absence of schwa with regard to the number of syllables marked by the university students.

7.1.4 Individual non-modified words: general success rate

The next step in the analysis applied to the success rate of individual words. For the purpose of this work, ten words with the score down to 70% were evaluated as successful (see table 5) and words with the score below 50% were evaluated as unsuccessful (see table 6). When the individual words were examined, the following charts were generated.

7.1.4.1 Most successfully marked non-modified words

As seen in Table 5, except for the words *opaque, campaign and phlegmatic*, all remaining items contain schwa. *Resurrection* appears twice on the list because it served as a testing item with the aim to discover whether the participants determined the stress randomly or not. The difference of 2% says that their choice was probably not random.

Word	Syll.	Schwa	corr. %	incorr. %
opaque	2	0	**90**	**10**
taboo	2	1	**84**	**16**
savannah	3	2	**82**	**18**
phlegmatic	3	0	**78**	**22**
metonymy	4	2	**77**	**23**
acknowledge	3	1	**77**	**23**
campaign	2	0	**76**	**24**
vernacular	4	2	**75**	**25**
fraternity	4	2	**74**	**26**
resurrection	4	2	**73**	**27**
resurrection	4	2	**71**	**29**

Table 5. A list of the most successfully marked non-modified words. *Syll* means how many syllables there are in the words. *Schwa 0* = words without schwa, *schwa 1* = schwa preceding the primary stress, *schwa 2* = schwa surrounding the primary stress.

7.1.4.2 Most unsuccessfully marked non-modified words

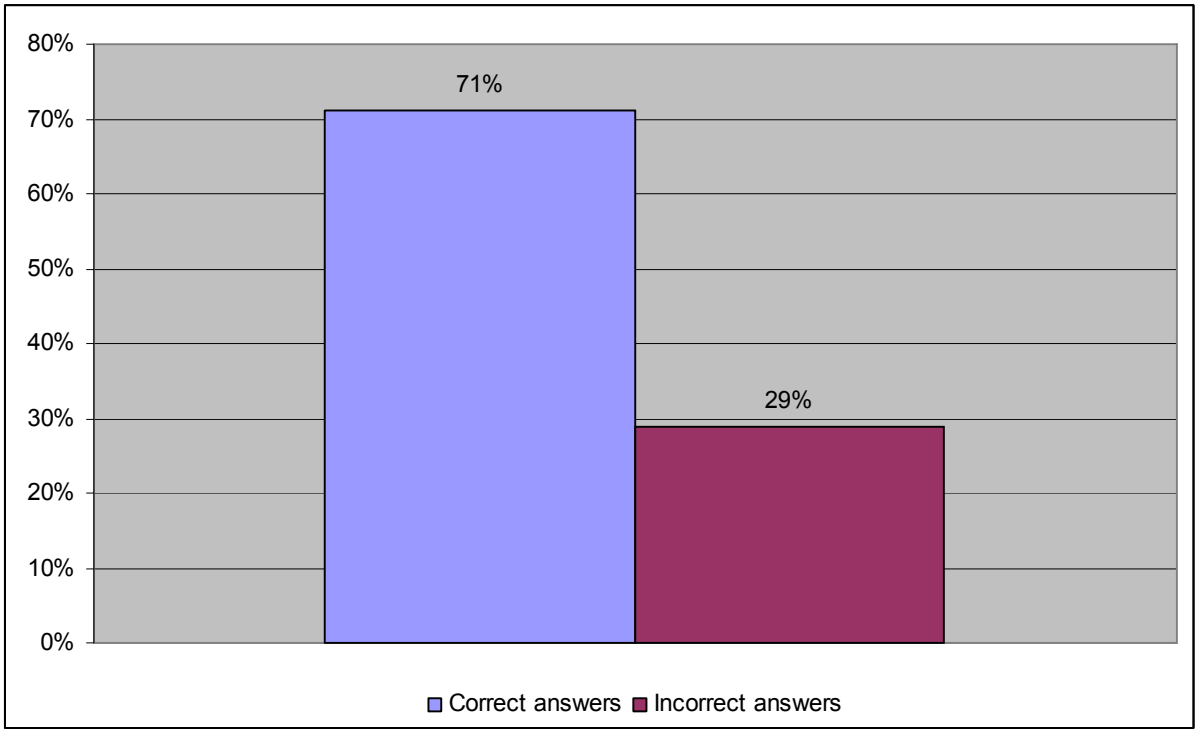
In Table 6 it is clear that three-syllable words with the primary stress on the last syllable were frequently marked incorrectly. Considering the presence or the absence of schwa, more words that lack this vowel appear in this ranking.

Word	Syll.	Schwa	corr. %	incorr. %
haematology	5	2	50	50
aberration	4	2	47	53
notwithstanding	4	0	45	55
petrified	3	0	39	61
sophisticated	5	1	39	61
jamboree	3	1	38	62
chimpanzee	3	0	33	67
Japanese	3	1	31	69
participate	4	0	29	71
statuette	3	0	28	72
hubcap	2	0	28	72
stewardess	3	1	22	78
graphite	2	0	18	82

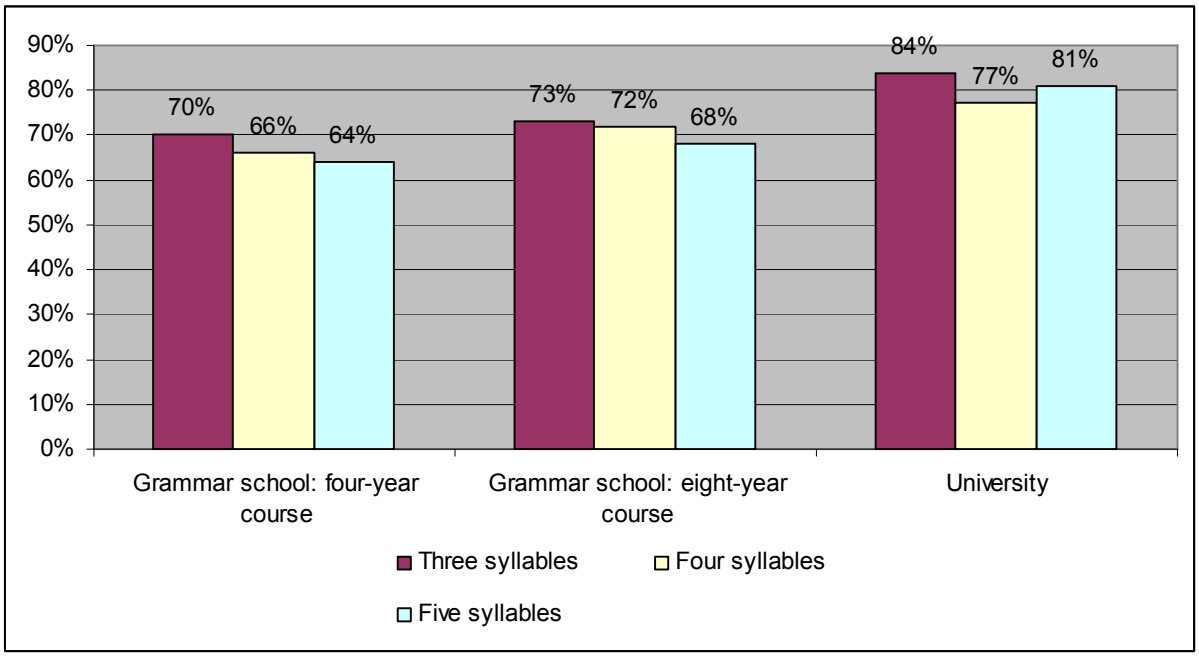
Table 6. A list of the most unsuccessfully marked non-modified words. *Syll* means how many syllables there are in the words. *Schwa 0* = words without schwa, *schwa 1* = schwa preceding the primary stress, *schwa 2* = schwa surrounding the primary stress.

7.2 Modified words

As it was previously mentioned, eleven words were recorded with the corresponding full vowels instead of schwa. At the same time, the original stress pattern was preserved. It was essential to preserve the same conditions as in non-modified words with the exception of one variable i.e. the full-vowel quality. The purpose of this was to find out whether the sound schwa really helps students to distinguish the primary stress in words or not. The overall results of this group are presented first (see graph 7 and graph 8).



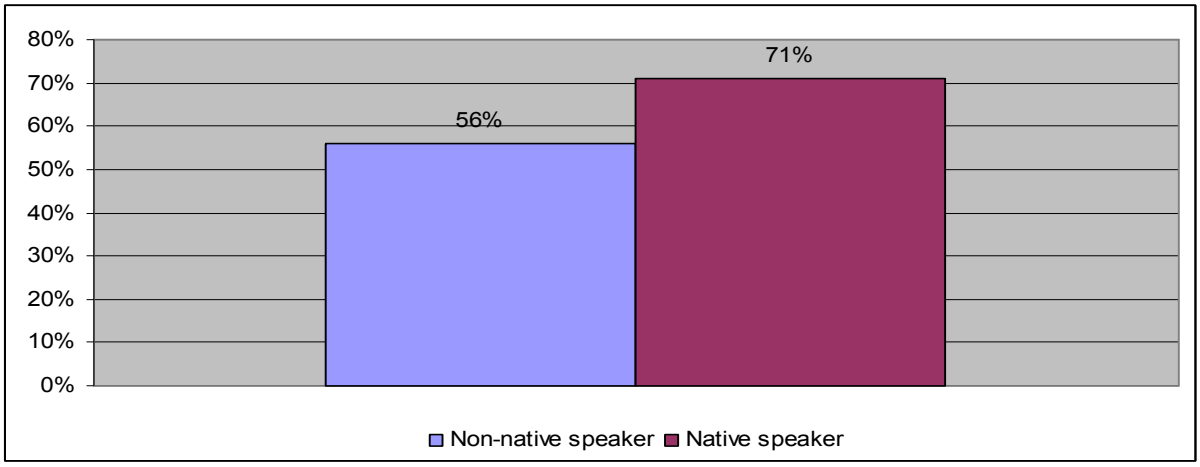
Graph 7. The percentage of correctly and incorrectly identified stressed syllables in modified words by all respondents.



Graph 8. The success rate in different groups of respondents according to the number of syllables in modified words.

The recording of these words was very difficult, because it was unnatural for the native speakers to pronounce it in the way they were instructed, so eventually the words with the

modified pronunciation had to be recorded by the author of the thesis, so the effect of comparing the pairs of words was not completely optimal as it caused a big difference and probable disruption to students. Graph 9 shows the overall success rate difference between the non-modified and modified words. Then, the following nine charts (table 7 – table 15) show the difference between the individual modified and non-modified words. *Explanatory note: NON-M = non-modified words, M= modified words, corr.= correctly determined words, incorr.= incorrectly determined words, G4 = four-year grammar school course, G8 = eight-year grammar school course, VS = university.*



Graph 9. The success rate of words recorded by a non-native and a native speaker.

	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**cosmopolitan**	**108**	**58**	**77**	**42**	51	62	31	**38**	41	57	31	**43**	16	52	15	**48**
M	**cosmopolitan**	**137**	**74**	**48**	**26**	60	73	22	**27**	52	72	20	**28**	25	81	6	**19**

Table 7. The comparsion of the word *cosmopolitan* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 16%.

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**sophisticated**	**72**	**39**	**113**	**61**	30	37	52	**63**	29	40	43	**60**	13	42	18	**58**
M	**sophisticated**	**76**	**41**	**109**	**59**	28	34	54	**66**	25	35	47	**65**	23	74	8	**26**

Table 8. The comparison of the word *sophisticated* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 2%

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**Japanese**	**57**	**31**	**128**	**69**	25	30	57	**70**	16	22	56	**78**	16	52	15	**48**
M	**Japanese**	**72**	**39**	**113**	**61**	28	34	54	**66**	26	36	46	**64**	18	58	13	**42**

Table 9. The comparison of the word *Japanese* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 8%.

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**solicitor**	**106**	**57**	**79**	**43**	41	50	41	**50**	47	65	25	**35**	18	58	13	**42**
M	**solicitor**	**89**	**48**	**96**	**52**	35	43	47	**57**	34	47	38	**53**	20	65	11	**35**

Table 10. The comparison of the word *solicitor* in its non-modified and modified version shows that in this case the non-modified version was more correctly marked with the difference of 9%.

Word No.	Word	corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**crystalography**	**97**	**52**	**88**	**48**	41	50	41	**50**	37	51	35	**49**	19	61	12	**39**
M	**crystalography**	**129**	**70**	**56**	**30**	52	63	30	**37**	53	74	19	**26**	24	77	7	**23**

Table 11. The comparison of the word *crystalography* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 18%.

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**vernacular**	**138**	**75**	**47**	**25**	54	66	28	**34**	59	82	13	**18**	25	81	6	**19**
M	**vernacular**	**161**	**87**	**24**	**13**	67	82	15	**18**	63	88	9	**13**	31	100	0	**0**

Table 12. The comparison of the word *vernacular* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 12%.

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**fraternity**	**136**	**74**	**49**	**26**	56	68	26	**32**	58	81	14	**19**	22	71	9	**29**
M	**fraternity**	**161**	**87**	**24**	**13**	69	84	13	**16**	65	90	7	**10**	27	87	4	**13**

Table 13. The comparison of the word *fraternity* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 13%.

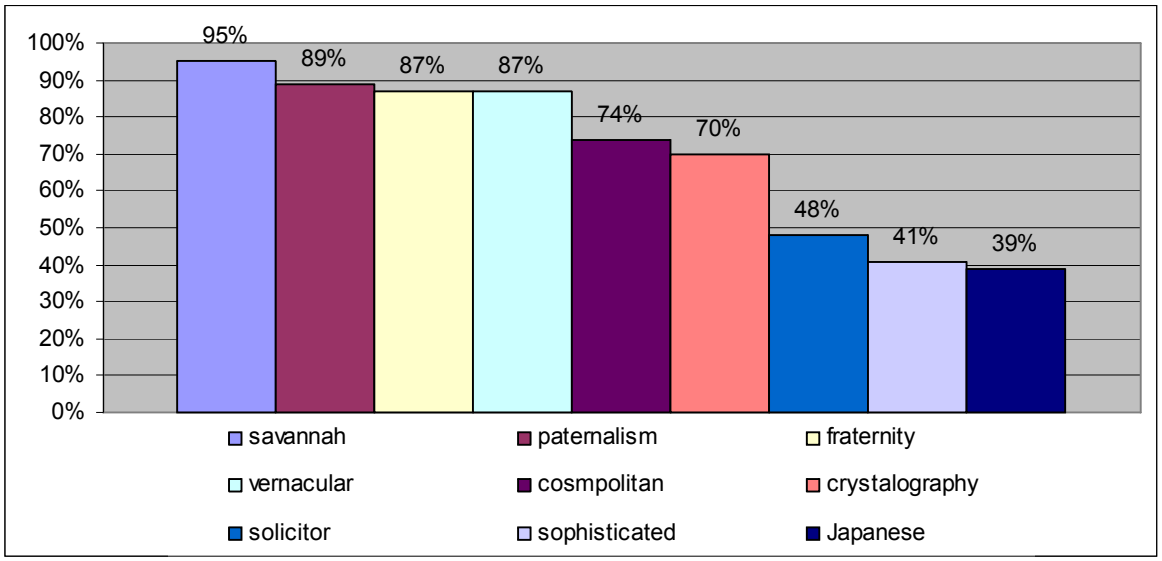
Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	Incorr. VS %
NON-M	**savannah**	**151**	**82**	**34**	**18**	64	78	18	**22**	58	81	14	**19**	29	94	2	**6**
M	**savannah**	**176**	**95**	**9**	**5**	78	95	4	**5**	67	93	5	**7**	31	100	0	**0**

Table 14. The comparison of the word *savannah* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 13%.

Word No.	Word	Corr.	corr. %	incorr	incorr. %	corr G4	corr. G4 %	incorr G4.	incorr. G4 %	corr G8	corr. G8 %	incorr G8.	incorr. G8 %	corr VS	corr. VS %	incorr VS.	incorr. VS %
NON-M	**paternalism**	**109**	**59**	**76**	**41**	45	55	37	**45**	44	61	28	**39**	20	65	11	**35**
M	**paternalism**	**164**	**89**	**21**	**11**	71	87	11	**13**	65	90	7	**10**	28	90	3	**10**

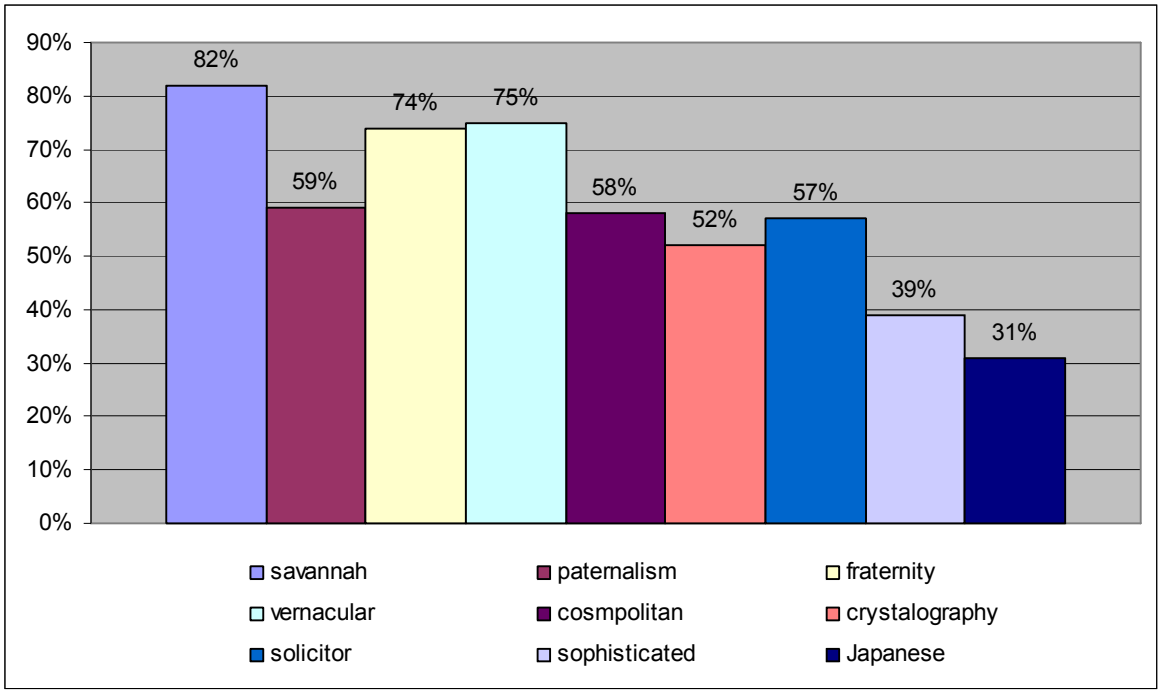
Table 15. The comparison of the word *paternalism* in its non-modified and modified version shows that the modified version was more correctly marked with the difference of 30%.

If we arrange the modified words according to the success rate, we get the ensuing ranking: 1. *savannah* (95%), 2. *paternalism* (89%), 3. *fraternity* and 4. *vernacular* (87%), 5. *cosmopolitan* (74%), 6. *crystalography* (70%), 7. *solicitor* (48%), 8. *sophisticated* (41%), 9. *Japanese* (39%) (see graph 10).



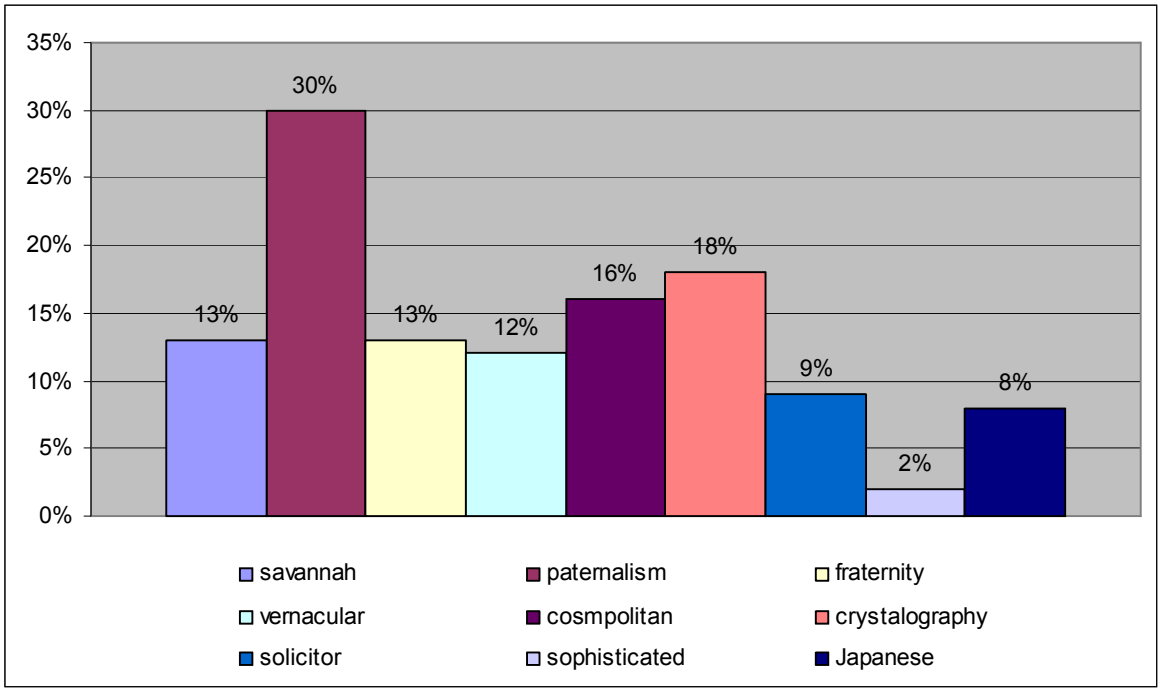
Graph 10. The success rate in words with the modified pronunciation.

If the non-modified items recorded by the native speaker are arranged, the following order is extracted: 1. *savannah* (82%), 2. *vernacular* (75%), 3. *fraternity* (74%), 4. *paternalism* (59%), 5. *cosmopolitan* (58%), 6.*solicitor* (57%), 7. *crystalography* (52%), 8. *sophisticated* (39%), 9. *Japanese* (31%) (see graph 11).



Graph 11. The success rate of the non-modified words.

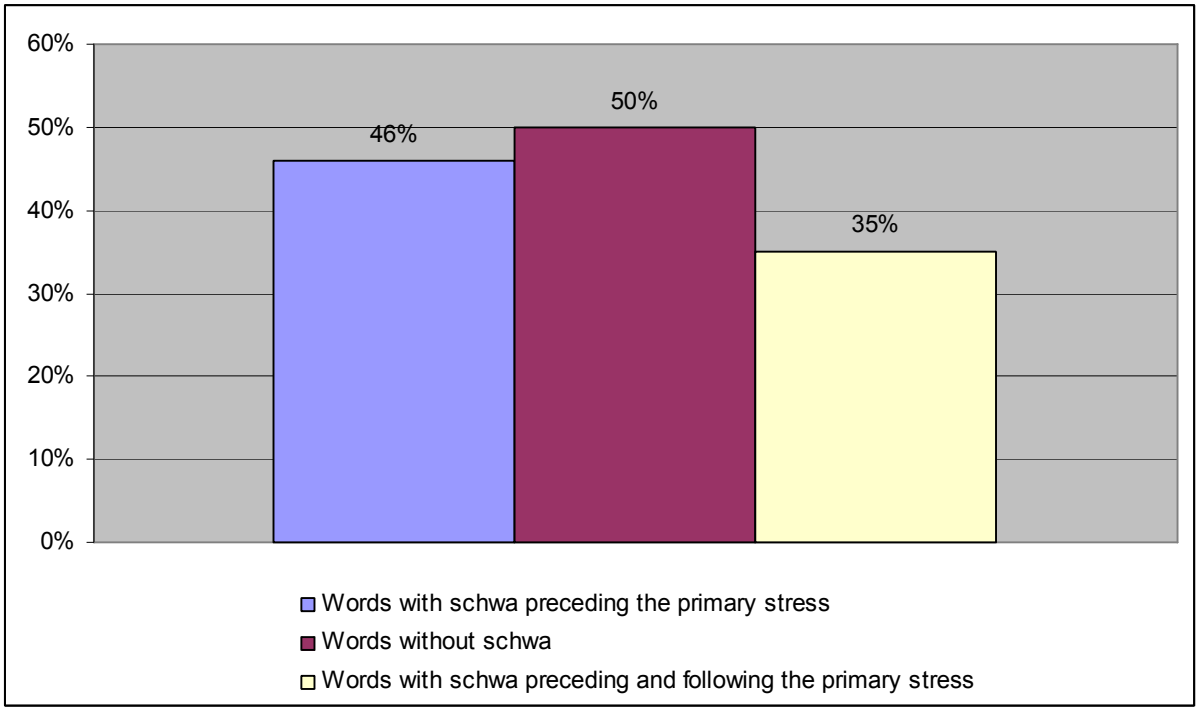
The words recorded exclusively with full-vowel qualities manifested a greater success rate, except for the word *solicitor*, where the correctness came out higher for the non-modified version including schwa. The above mentioned lists show that words *savannah, fraternity, cosmopolitan, sophisticated, Japanese* take the same places on both scales of modified and non-modified words, though the percentage varies. The descending order of the pairs of words will now be ranked on the basis of the proportional difference between each couple. The most correctly marked pair of words, with the difference of only 2% is *sophisticated*. It is followed by *Japanese* with an 8% difference, *vernacular* with a 12% difference, both *fraternity* and *savannah* brought a 13% difference, *cosmopolitan* had a difference of 16%, *crystalography* 18% and *paternalism* had even 30%. *Solicitor* drew a 9% difference, but the students were more successful determining the stress in the version with schwa here (see graph 12).



Graph 12. The percentage difference between the same words recorded with and without altered pronunciation.

7.3 Error rate

The error rate detected in this research has a few possible factors. The most relevant ones being the language level of the participants, listening to two completely different speakers, negative transfer from the mother tongue and low exposure to the examining phenomenon. Czech learners of English are not used to reducing or omitting vowels in unstressed positions in order to keep the natural rhythm of speech, they do not need to think of where to put the main stress in Czech as it always falls on the first syllable and they basically "read what they see", because in most cases they can rely on the grapheme-to-phoneme correspondence. This unfortunately does not apply to the English language and without the right input and proper training students cannot simply adjust to it. The following graph displays the results of words with or without schwa in non-modified words (see graph 13).



Graph 13. The error rate of the non-modified words according to the absence or the presence of schwa either preceding the primary stress or both preceding and following the primary stress.

The mistakes might have been supported by the native speaker's accent and, as a few participants claimed, the faster pace in which the items were recorded. Secondary stress probably also caused a lot of confusion especially in three-syllable words with the accent on the last syllable.

The error rate in words such as *cosmopolitan, haematology, notwithstanding or sophisticated* might have been caused by its length, because as the author noticed, the participants tried to silently repeat each word in order to correctly determine the stress, so it follows that the longer word, the less time to repeat, thus a possible higher error rate.

Besides, the words used in the test were not recorded in isolation, but in the carrier sentence, so that they sounded as natural as possible, which, of course, does make the stress less obvious then.

The error rate of the modified words was definitely lower. Four words *sophisticated, acropolis, solicitor and Japanese* were the least successful in this group, possibly due to their length.

8. Discussion

Preparation and production of a valid and reliable perception test brings its rigours and not all them have been surpassed. Initially, the plan was to record all words by the same speaker, which would avoid any confusion to the students as well as any distortion of the results. Unfortunately, this was impossible to accomplish. It was found out that the phrases recorded by the author of the thesis, the non-native speaker, had a lower error rate. For the words numbered 1 to 36, recorded by the native speaker, 56% of respondents answered correctly, while the words numbered 37 to 47, recorded by the author of the thesis, were answered correctly by 71% of students, which makes a 15% difference in favour of the non-native speaker, which violates the initial expectations. This was in all probability caused by the absolute dissimilarity of both speakers as well as the slower pace the modified words were recorded in and foremost by the author's Czech accent, which was familiar to the participants, hence better perceivable. This problem might have been solved by either the author recording both types of the pronunciation herself or by making the alterations by synthesis.

The overall results reflect the language level of the respondents, therefore the university students manifested a higher success rate than the grammar school students. The differences between the grammar school courses might have been caused by different study frameworks and arrangements of the curriculum in each sector. However, to the best of the author's knowledge, no group of the respondents was trained in the target phenomenon.

When the number of syllables is considered, four-syllable words were the most successfully marked ones, followed by two-syllable and then five-syllable words. Interestingly, three-syllable words noted a drop. They were namely *petrified, jamboree, chimpanzee, Japanese, statuette, stewardess.* After the analysis was completed, the author listened to the recording again trying to trace some traits which would pointed at some common tendencies. She played the recording to another intermediate learner of English and asked her to explain what indicators led her to mark the stress incorrectly. As many of the test-takers, she had problems mostly with three-syllable words. She explained that the first syllable seemed louder to her and that is why she chose to mark it. In addition, she said it felt unnatural to choose the last syllable. Although loudness is one of the factors affecting the perception of stress, in this case, without instrumental analysis, it is rather

ambiguous, thus irrelevant. It, however, most likely indicates the existence of the secondary stress, which might have confused students. Another factor functioning in the perception of stress is its placement within words in their mother tongue. In Czech the primary stress always falls on the first syllable of a word, so any other placement might be not particularly easy to identify.

Taking non-modified words into consideration, the highest success rate was noticed in words with schwa flanking the primary stress. This was followed by schwa preceding the primary stress and words with the absence of schwa reached the lowest successfulness. Some tendency towards the schwa playing at least a little role in the identification of the primary stress may be noticed even from the table of the most successful words where seven out of ten include this mid-central vowel. Five of these eight include schwa from both sides of the primary stress (*savannah, metonymy, vernacular, fraternity, resurrection*). Two words have schwa preceding the primary stress (*taboo, acknowledge*). *Resurrection* was used twice as an item which should demonstrate whether students marked the stress randomly or not. The 2% difference between the words indicates that the choice of the stress was not coincidental and that the majority of the participants who determined it correctly were consistent in their judgements and ensuing marking. The placement of the primary stress in words *hubcap* and *graphite* is arguable as dictionaries suggest the primary stress on the first syllable, however the participants usually marked the second syllable. The recording might not be absolutely clear, but no measurements were performed.

On the whole, the devised perception test proved to be a suitable testing device, however, in order to achieve more precise results, the track should have been recorded by one speaker in a studio equipped by an anti-noise system and the test should have been carried out in a room provided with headphones, so that any disruption or disturbance was avoided.

Conclusion

The identification of stressed syllables in English words may present a difficult task for foreign learners, especially if their mother tongue displays different rhythmical properties. In the English language the situation is more complex than in Czech not only in terms of the completely distinct vowel sound systems, but also in terms of the word stress and rhythm with very frequent vowel reduction. The primary cues for discriminating the stressed syllable are prominence factors, in other words loudness, length, pitch and quality, which however may be smoothed in connected speech.The presence of the mid-central vowel schwa in the immediate surrounding of stressed syllables can be also employed as an indicator of (non)-prominence. Schwa is a vowel that only occurs in unstressed positions in English and even though it does not have an equivalent in the Czech language, it is not a completely unknown sound as Czech speakers use it when producing some letters in isolation, e.g. /bə, də, sə/ (Skaličková, 94) or in fast speech where it occurs as a result of carelessness. Furthermore, the longer counterpart of schwa, */ɜ:/*, is frequently used as the so-called "hesitation sound" (Volín qtd. in Cvrček 44).

As a matter of fact, L2 learners are strongly influenced by their L1. In this case, the negative transfer from the Czech language has a strong influence on perceiving the English vowel system, word stress and rhythmical patterns. The vowel system in English is richer than the Czech one and vowels in unstressed syllables undergo the process of vowel reduction, which Czech speakers filter through the set of short vowels they already know from their mother tongue. The word stress is fixed in Czech and always falls on the first syllable as opposed to English which is characterised by the free placement of stress and its lexical function. It follows that in Czech full-vowel quality is pronounced in both stressed and unstressed positions, but in English it is essential to distinguish between strong and weak syllables, both on the word and the sentence level, in order to preserve the natural rhythm of speech. English rhythm is so-called "stress-timed" which is perceived as consisting of regular intervals between stressed syllables. On the contrary, Czech is a syllable-timed language were stressed and unstressed syllables are of approximately equal length and the time between the stresses is more variable than in its English counterpart. Therefore, Czech learners may find it very unnatural and difficult to achieve proper pronunciation. To make it even more complicated, English distinguishes predominantly

three levels of stress – syllables carrying the primary stress, secondary stress and unstressed syllables, with the secondary stress being lower than the primary stress, but still preserving the full-vowel quality longer than in an unstressed syllable. There is a possibility that students will confuse the secondary for the primary stress, especially if it occurs on the first syllable where the Czech stress falls as well.

The vowel reduction in unstressed syllables helps the neighbouring stressed syllables stand out in the speech signal and maintain the natural rhythm of speech. As this is a phenomenon completely unknown in the Czech language, learners of English usually struggle with acquiring it. The aim of this work was to explore how sensitive Czech learners of English are towards this secondary clue in determining the stress placement. The research tool, a perceptional test, was designed in order to show whether or not the schwa sound in the immediate vicinity of the primary stress helps Czech learners of English to determine this stress.

The results showed the highest success rate for words with schwa surrounding the primary stress, however, the overall results, covering words both with the presence and the absence of schwa, displayed very balanced results, which definitely implies that Czech listeners are rather not sensitive to the examined phenomenon and they tend to follow other factors in determining the primary stress, higher pitch and loudness in particular. Hence, the above stated hypothesis was confirmed only partially. It is apparent from the graphs that although schwa somehow supports the easier identification of the primary stress, the effects are not striking, because the overall results, including also words without schwa, were very balanced. It is vital to highlight, though, that to the best of the author's knowledge none of the students who took part in the research were trained in the target phenomenon. So it can be assumed that if a purposeful input had been provided, different results might have appeared.

It has been noticed in the area of production that Czech speakers are, in certain positions, able to produce schwa on the level of a native speaker. Native speakers, however, realize this sounds in positions where Czech speakers produce full vowels instead (Volín, *Research in Language* 31-37*).*

It is important to mention the limitations of the research design. First of all, the speaker could not be properly trained, so he did not succeed in pronouncing the modified words and the author of the thesis had to record it herself. This resulted in possible confusion to

the test-takers as the two speakers were completely different. Furthemore, the author's Czech accent was familiar to the participants and she, unintentionally, recorded the items in a slightly slower pace. Last but not least, the testing items could not be recorded and assigned in a soundproof room.

Although these factors could have had some impact on the outcome of the research, some tendency was proved. On the one hand, schwa in the immediate vicinity of the primary stress seems to play a certain facilitative role in the identification of the word stress. On the other hand, this tendency did not turn out to be huge. Czech learners appear to be more sensitive to other clues indicating the primary stress. In order to develop the ability to perceive vowel reduction correctly and exploit it for determining stressed parts on both word and sentence level, this aspect should be addressed in English classes and teachers should raise students' awareness about the role of schwa in prominence patterning.

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Appendix

A compact disk with the recordings that were made for the research is attached to the thesis.

The answersheet of the perception test is included in the thesis.

PERCEPČNÍ TEST

věk: **pohlaví:** **jazyková úroveň:** **doba studia AJ:** **kontakt s rodilým mluvčím:** ANO | NE | Jak často

Listen to the following words and mark the stressed syllable with a cross (stressed = more prominent, stronger). One dash (hyphen) = one syllable.
Poslouchejte a označte křížkem přízvučnou slabiku (přízvučná = hlasitější, důraznější). Jedna čárka = jedna slabika.

Examples

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3. — — —
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Listening 1

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Listening 2

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Listening 3

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PERCEPČNÍ TEST

Listening 4

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